higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

SOIL SCIENCE
NQF LEVEL 2

(1011002)

8 March 2018 (X-Paper)
09:00–12:00

This question paper consists of 13 pages.

NCS

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TIME: 3 HOURS
MARKS: 150

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Write neatly and legibly.

NCV

SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 Atoms gain … to become ions.

A mass
B neutrons
C protons
D electrons

1.1.2 … electrons occupy the last energy level of an atom.

A Negative
B Slightly negative
C Valence
D Slightly positive

1.1.3 The atomic mass of an element is equal to the mass of ... of the atom.

A neutrons
B electrons
C protons
D nucleus

1.1.4 ONE of the radicals:

A OH
B H_2O
C CO_2
D NH_4

1.1.5 Plants lose water through:

A Condensation
B Evaporation
C Transpiration
D Evapotranspiration

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1.1.6 Available plant nutrients can be absorbed by the plant during a particular growing...

A week.
B season.
C day.
D month.

1.1.7 Why does the older region of a root experience water movement blockage?

A Because the region is covered with a cork layer.
B Because the region has an old cell.
C Because there is no growth in that region.
D Because the old region is connected to the stem.

1.1.8 Soil is a ... system.

A deposition
B biological
C dynamic
D stable

1.1.9 Which process concerns the deposition of minerals that move from the A horizon to the B horizon?

A Leaching
B Diffusion
C Illuviation
D Eluviation

1.1.10 Seeds germinate quicker when soil temperature is ...

A 25 °C.
B 30 °C.
C 20 °C.
D 10 °C.

(10 × 1) (10)

1.2 Give ONE term for each of the following descriptions. Write only the term next to the question number (1.2.1–1.2.10) in the ANSWER BOOK.

1.2.1 A substance made up of different substances that are not chemically bonded

1.2.2 The ratio of the amount of water in the air to the amount that the air can hold at that temperature

1.2.3 The type of soil that feels like smooth plastic

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1.2.4 Moisture found on the grass in the morning, especially if the previous day was hot

1.2.5 A chemical used in soil analysis, which is able to dissolve the plant nutrients in the soil

1.2.6 A particle of an atom with no charge

1.2.7 A sucking force that is created when transpiration takes place and water evaporates through the stomata of a leaf

1.2.8 The region of the root where water absorption mostly takes place

1.2.9 The grouping of soil particles into aggregates

1.2.10 The smallest particle into which an element can be divided

(10 × 1) (10)

1.3 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–L) next to the question number (1.3.1–1.3.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.3.1	Spirits of salts is its nonscientific name	A	vaporisation
1.3.2	Sharing of electrons	B	altitude
1.3.3	When molecules begin to leave the surface of the water and change into gas at boiling point	C	total plant nutrients
1.3.4	Physical features of land	D	nitrogen
1.3.5	Liquid phase of the soil	E	cations
1.3.6	Height above sea level	F	HCℓ
1.3.7	Stimulates lush vegetative growth	G	filtration
1.3.8	All nutrients in the soil	H	iron
1.3.9	Positively charged ions	I	soil water
1.3.10	Process used to separate mixtures	J	topography
		K	covalent bonding
		L	latitude

(10 × 1) (10)

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1.4 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.4.1–1.4.10) in the ANSWER BOOK.

1.4.1 The volume of an atom comes from the nucleus.

1.4.2 Tension within the rock is caused by expansion and contraction at different rates.

1.4.3 Humus improves soil texture.

1.4.4 The root cap is mainly found in the root hair region.

1.4.5 A build-up of salt in clay soil makes it brackish.

1.4.6 Back diffusion is when water diffuses back into the leaf from moist air.

1.4.7 An extremely small particle of an atom is a proton.

1.4.8 Soil horizons usually lie parallel to the soil depth.

1.4.9 Soil micro-organisms are very active at a temperature of 10 °C.

1.4.10 The best time to take a leaf sample is from the beginning of January to the end of February.

(10 × 1) (10)
[40]

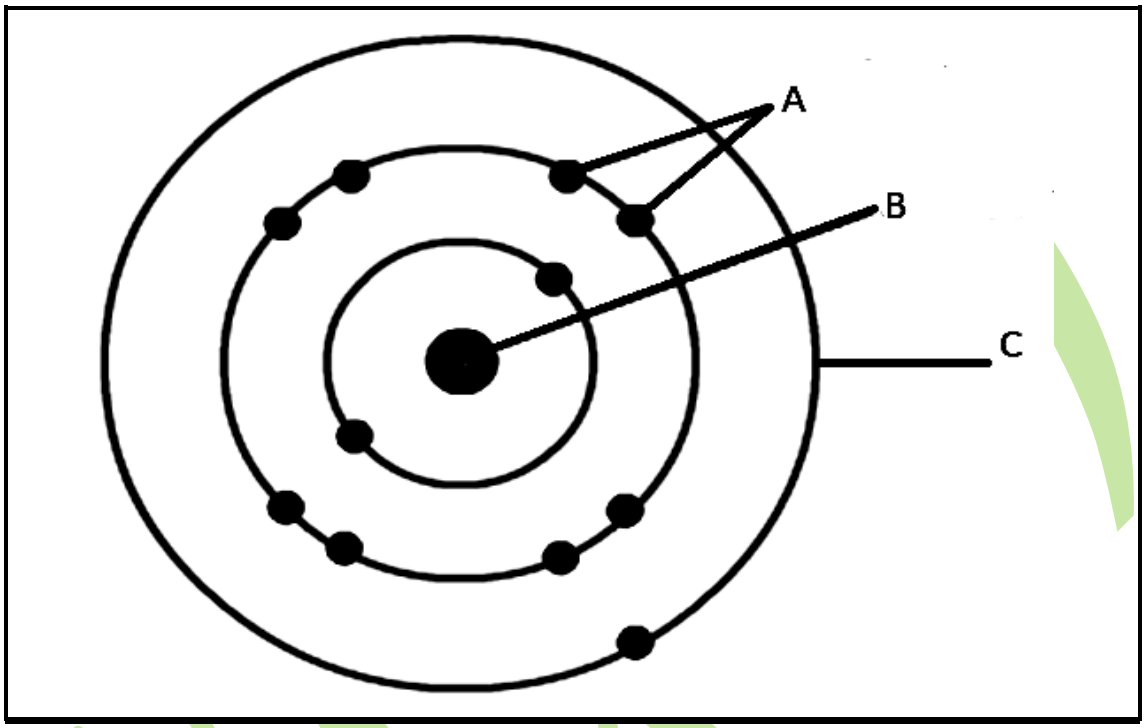
TOTAL SECTION A: 40

SECTION B

Start each question on a NEW page in this section.

QUESTION 2

2.1 Study FIGURE 1 below and answer the questions.



[Source: *www.google.co.za*]

FIGURE 1

2.1.1 Identify the components of an atom marked A, B and C. (3)

2.1.2 Give the name of the atom depicted in the diagram. (1)

2.1.3 What is its atomic number? (1)

2.1.4 Name TWO particles found in the structure marked B and give their charges. (2 × 2) (4)

2.1.5 Give the Lewis structure of this atom. (2)

2.1.6 The chemical formula for salt is NaCℓ.

Explain how two atoms combine to form NaCℓ. (4)

2.2 Complete the table below by filling in the missing information. Write only the missing information next to the question number (2.2.1–2.2.7) in the ANSWER BOOK.

ELEMENT	SYMBOL	ATOMIC NUMBER	VALENCE ELECTRONS
2.2.1 …	N	2.2.2 …	5
Calcium	2.2.3 …	20	2.2.4 …
2.2.5 …	2.2.6 …	15	2.2.7 …

(7 × 1) (7)

2.3 Answer the following questions based on mulching.

2.3.1 Define the term *mulching.* (2)

2.3.2 List THREE types of materials that farmers can use when practising mulching on their farms. (3)

2.4 2.4.1 Differentiate between *mixtures* and *compounds*. (4)

2.4.2 Name TWO processes used to separate mixtures. (2)

2.5 The formula of a compound HCℓ is given.

2.5.1 Name the elements of this compound. (2)

2.5.2 Give the name of this compound. (1)

2.5.3 Is this a polar or a nonpolar molecule? Give a reason for the answer. (3)

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2.6 Relative humidity can be measured using a wet bulb thermometer and a dry bulb thermometer.

Study the relative humidity table (shown in %) below and answer the questions.

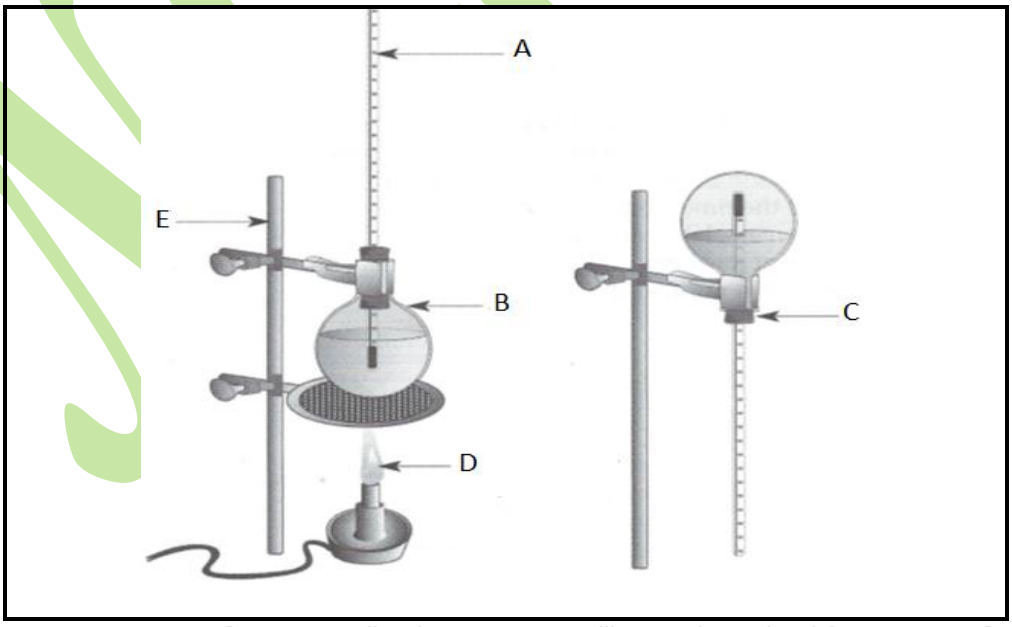
Dry bulb in degree Celsius	**Difference between wet bulb and dry bulb readings in degree Celsius**				
°C	2°	4°	6°	8°	10°
10°	77	55	34	15	
12°	78	58	39	21	
14°	79	60	42	22	10
16°	81	63	46	27	13

2.6.1 Indicate the relative humidity if the dry bulb thermometer reading is 12 °C and the reading on the wet bulb thermometer is 6 °C. (1)

2.6.2 What is the reading of the wet bulb thermometer and dry bulb thermometer respectively when the relative humidity is 63%? (2)

2.6.3 Name THREE places on a farm where relative humidity must be measured. (3)

2.7 FIGURE 2 below shows a diagram of condensation investigation. Label the diagram by writing the answer next to the letter (A–E) in the ANSWER BOOK.



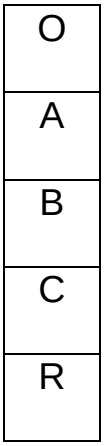
[Source: *Soil Science L2 Macmillan student's book* by W. Burger]

FIGURE 2

(5)
[50]

QUESTION 3

3.1 Study the figure below and answer the questions.



Which horizon is best associated with each of the following descriptions:

3.1.1 Solid rock

3.1.2 Fresh organic matter

3.1.3 Illuvial horizon

3.1.4 Loose parent material

3.1.5 Eluvial horizon

(5 × 1) (5)

3.2 3.2.1 List THREE groupings of organic matter. (3)

3.2.2 Calculate the organic matter percentage if:

Mass 1 (M1) = 35 g, Mass 2 (M2) = 55 g and Mass 3 (M3) = 46 g (3)

3.3 Define each of the following:

3.3.1 Soil texture

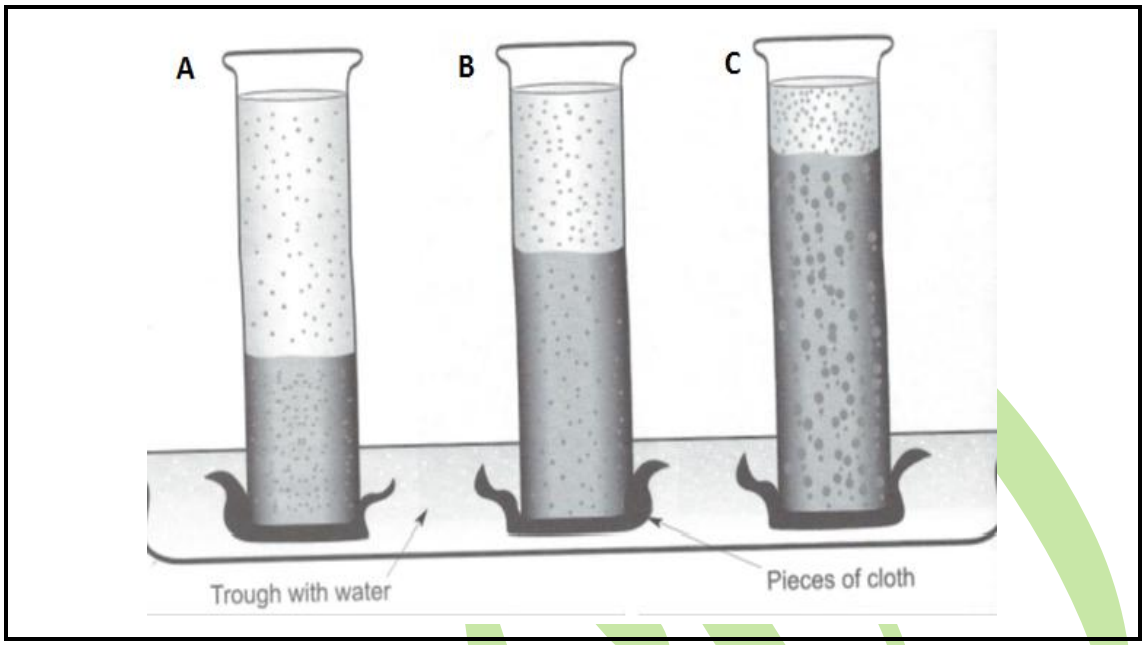
3.3.2 Soil structure

3.3.3 Aspect

(3 × 2) (6)

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3.4 Study FIGURE 3 below and answer the questions.



[Source: *Soil Science L2 Macmillan student's book* by W. Burger]

FIGURE 3

3.4.1 Give the name of the process depicted by the experiment in FIGURE 3. (1)

3.4.2 Define the process mentioned in QUESTION 3.4.1. (2)

3.4.3 In Figure 3 above, which soil type shows/indicates the highest water level? Give the reason for it having the highest water level. (3)

3.4.4 Label A, B and C. (3)

3.5 Give THREE characteristics of dark soil. (3)

3.6 Which temperature is regarded as optimal soil temperature for most of the processes that take place in soil? (1)

3.7 Complete the following table that summarises the influence of soil texture on the physical properties of soil. Do NOT copy the table. Write only 'high' or 'low' next to the question number (3.7.1–3.7.10) in the ANSWER BOOK.

SOIL PROPERTY	SAND	CLAY
Water retention	3.7.1 …	3.7.2 …
Aeration	3.7.3 …	3.7.4 …
Heat conduction	3.7.5 …	3.7.6 …
Water absorption	3.7.7 …	3.7.8 …
Drainability	3.7.9 …	3.7.10 …

(10 × 1) (10)
[40]

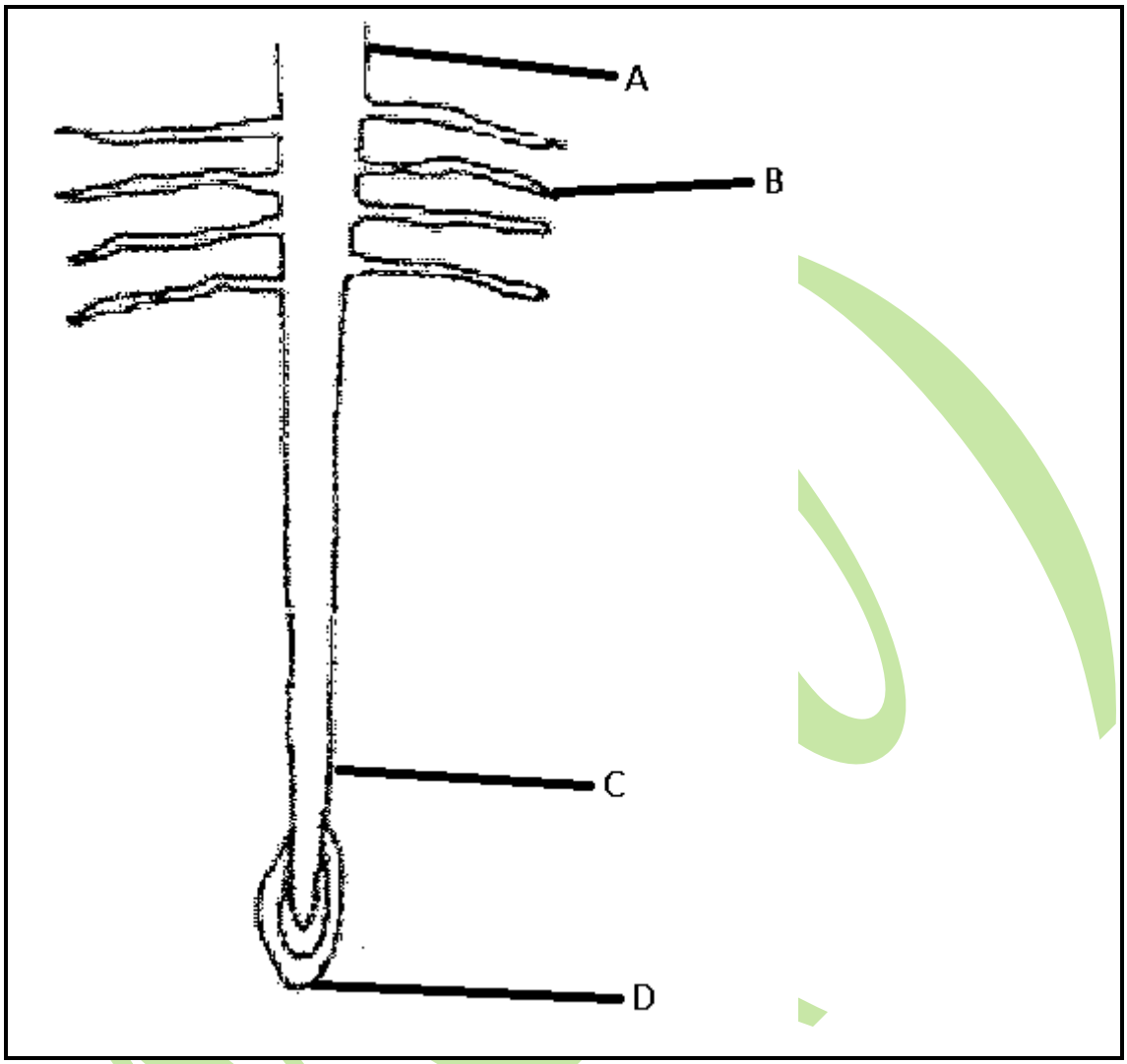
QUESTION 4

4.1 List FIVE functions of water in plant growth. (5)

4.2 Differentiate between *macro plant nutrients* and *micro plant nutrients*. (2 × 2) (4)

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4.3 Study DIAGRAM 4 below and answer the questions.



[Source: *Soil Science L2 Macmillan student's book* by W. Burger]

FIGURE 4

4.3.1 Label A–D. (4)

4.3.2 Give the letter of the area covered by the corky layer. (1)

4.3.3 What is the main function of the area marked B in the diagram? (2)

4.4 List THREE toxicity symptoms of nitrogen. (3)

4.5 Which time of the year is the best for leaf sampling? (1)

[20]

TOTAL SECTION B: 110
GRAND TOTAL: 150

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